Biocompatibility of Ultrananocrystalline Diamond (UNCD) Thin Films

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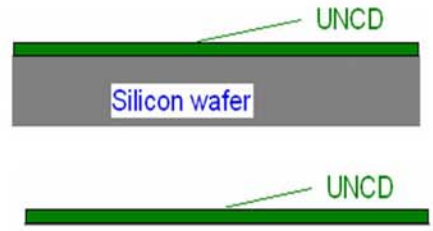
Motivation

Need alternative implantable materials with appropriate mechanical, physical, chemical properties, as well as biocompatibility

Major Accomplishments

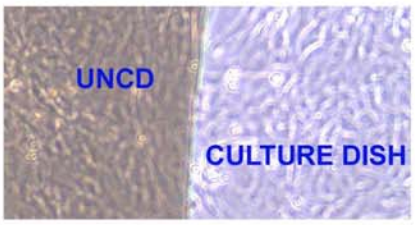
Development of UNCD thin films



UNCD film is grown on Si substrate. The Si substrates were etched to prepare free-standing UNCD film

Cross section SEM image of the UNCD film

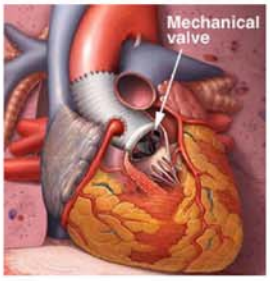
Cell culture on UNCD film



Mouse Embryonic Fibroblast (MEF) cells were cultured 36 hours in incubator. The cells growth on UNCD reached the same confluency as the culture dish.

Impact

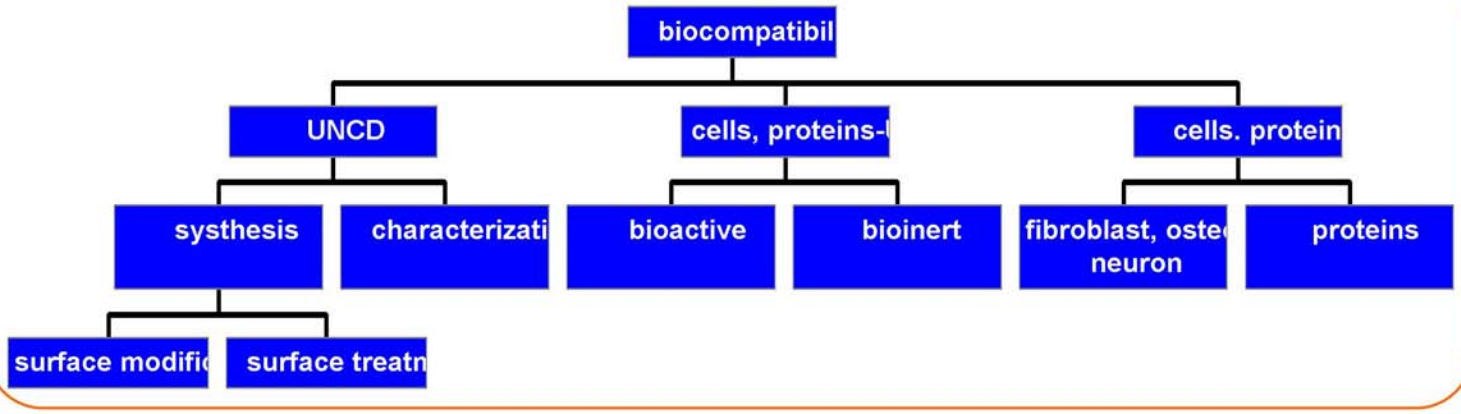
High social impact on biosensors and implantable medical devices



Possible applications as artificial joints artificial biological and mechanical heart valves (www.biomet.com/patients/bestimplant.html, www.mayoclinic.org/marfan-rst/valvesurgery.html)

- Artificial implants such as hip and knee implants have benefited millions of people. However, the service time is only 8-10 years and a patient can have only two total joint implant replacements.
- UNCD coated artificial implants will have long service time.
- As the 3D scaffold for cell growth, the cell-seeded UNCD will replace the traditional artificial joints.

Future Directions



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